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# SKETCHES ON ANIMAL LIFE;

AN INAUGURAL ESSAY,

SUBMITTED TO THE CONSIDERATION

OF

THE HONOURABLE ROBERT SMITH, PROVOST,

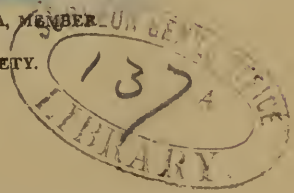
AND OF THE

REGENTS OF THE UNIVERSITY OF MARYLAND,

BY JOHN CROMWELL,

OF HUNTINGDON COUNTY, PENNSYLVANIA, MEMBER

OF THE BALTIMORE MEDICAL SOCIETY.



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Diseases differ from each other only in the degree of accumulation or exhaustion of ex-  
citability. Brown.

Diseases have generic differences; they differ in kind as well as degree....*Laws of Nature.*

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TO

DOCTOR JOHN CROMWELL,

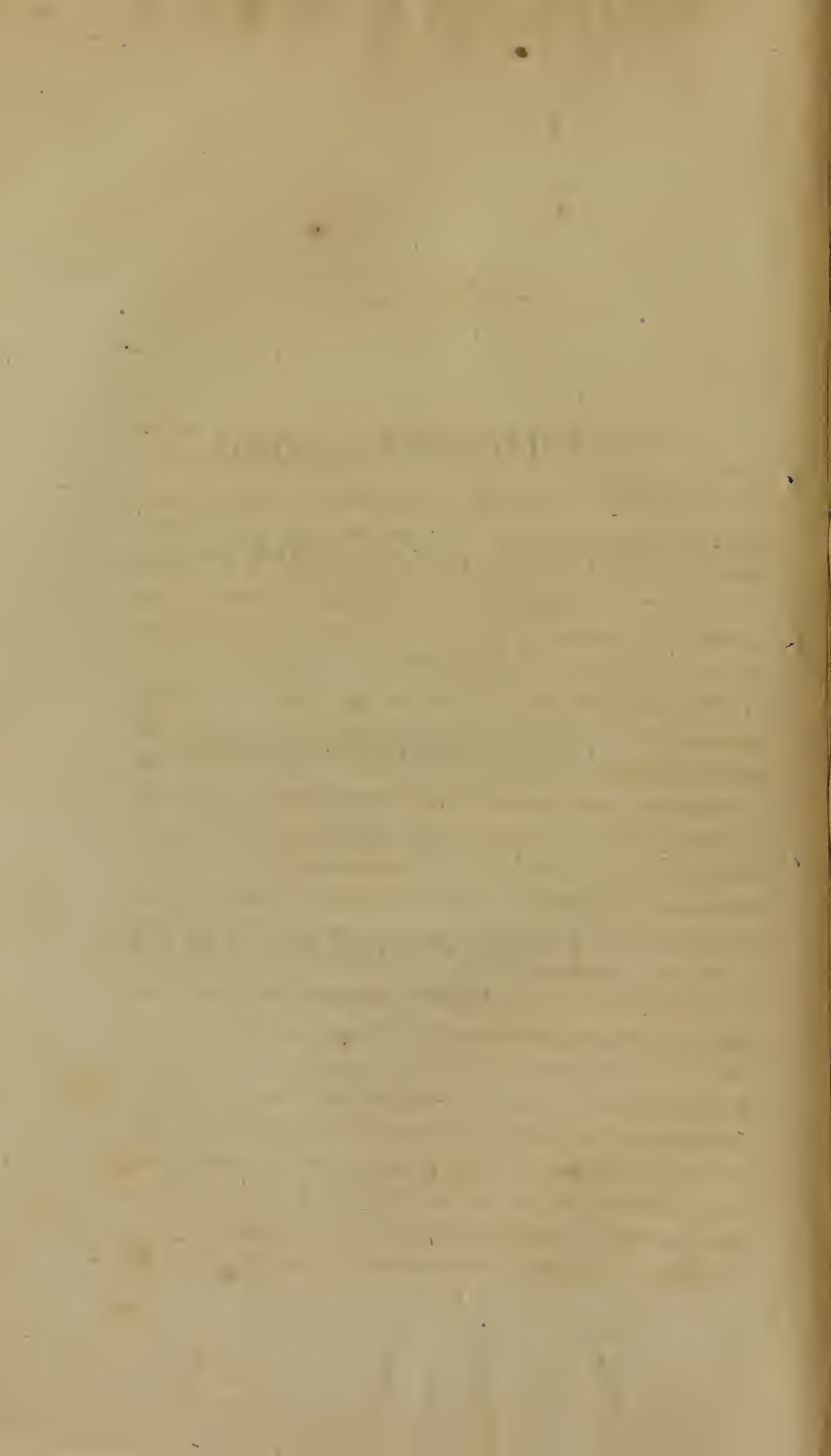
*The following pages are gratefully inscribed,*

BY ONE, WHO AS A NEPHEW,

IS INDEBTED FOR UNVARYING KINDNESS AND REGARD;

AS A PUPIL,

*For every attention which could facilitate his studies  
or enlarge his capacities.*





## INTRODUCTION.

I PRESENT my reflections upon the subject of the following dissertation, not from any voluntary indulgence of a disposition to obtrude my immature thoughts upon the notice of those, who, I am satisfied are much better qualified than I am, to examine accurately and reason justly; but in compliance with a formal obligation, imposed by the caution and wisdom of the institution whose favours I solicit.

The understanding of mankind generally, has rarely been quick in its apprehension of important truth; and, when acquired, seldom been active in cultivating the advantages, to be derived from its attainment. On a few subjects, those particularly more immediately relating to man's every-day pursuits, his business and his pleasures, information is readily imbibed, and rapidly diffused; while on others with which his concern, though all important, is of less frequent occurrence, intelligence is received with indifference, and though conviction may admit the possibility of its practical utility, yet the motive not being immediate, the benefit is entirely neglected, or but partially pursued. I speak of mankind as a body: and in illustration of the position, it would be unnecessary because the fact is familiar, to adduce man's interest in religion, his indifference to its obligations, and his inattention to its advantages. Our profession, and its relation with general physical welfare, its capacities for contribution to the

stock of human comfort and happiness, and the frigid apathy with which they have been contemplated, or the feeble attempts exerted to call them into action, is unfortunately evidence sufficient for its establishment. Let us not be taunted with the imputation, that this is the censure of arrogated merit, for disappointed ambition; the consequence affects society, rather than the profession; and if we are qualified for the relation we assume to it, society can confer upon us no obligation, its most flattering notice will fall short even of reward. In a few instances man has withdrawn his eager attention from exterior circumstances, and directed it more particularly upon himself; he has paused to enquire, by what means he should most effectually preserve a health, or protract an existence, both of which observation had convinced might be lost; and both of which he had strong reasons for supposing, had upon many occasions, been lost prematurely. There could be no difficulty in deciding upon the means most extensively conducive to the attainment of the object: there could be no difficulty, for the mode was solitary, it suggested itself, and the result has been its partial, though but partial adoption. A few occasional attempts have been made by the delegated guardians of social welfare, to arrest the arm of ignorance and rashness, and transfer the implements of man's safety or destruction, into hands guided by superior intelligence, and purer motives.

The constituted authorities of the society in which I live, have thought proper to commit this power, into hands qualified to direct its application; I think they have acted wisely, and in obedience to the provisions of that power, I submit my claims to its patronage, in their present form. Were not compliance a duty, conscious imbecility

would have dictated a silence, which, though it cannot offer distinction, affords security.

In concluding the performance of this task, I entertain no flattering presumption, that I have proposed any view of the subject it embraces, calculated to confer celebrity upon myself, or to contribute in any degree, to the improvement or gratification of others. My work will live for a day, and be forgotten with the occasion which gave it birth : should it prove not unworthy of even this ephemeral existence, my most earnest expectations will be gratified ; I am far from confident that it merits any thing more.

The inquiry will perhaps not be made, how far I can justly arrogate a claim to originality in the sentiments adduced, in the following pages : but were that inquiry proposed, candour would compel me to acknowledge, that the sentiments were mine by adoption, that my limited stock of knowledge, like that of mankind in general, was more the result of observation, than invention ; I cheerfully acknowledge my obligations to the researches of respectable writers, and the opinions of intelligent lecturers. Strict originality is seldom attainable, and is not essential to utility ; I believe in common understanding, it has no distinct signification, and if it were indispensable in the discussions of science, I fear but few could be engaged in the pursuit. In reviewing the history of man's social improvement, we cannot avoid an observance of the intimate connexion each succeeding age has preserved with the circumstances which characterised the condition of its predecessor. It is true, that the knowledge which the former had but just entered upon, the latter has frequently extended, though rarely perfected. New generations have profited by the partial attainments of those who had passed away, sometimes even by their errors ; and intellec-

tual and moral refinement, appears to be one connected chain, the links of which, with few exceptions, have fortunately become more polished, as they were added. The history of particular sciences, also, will afford us a proof how generally their cultivation and enlargement, has depended upon the advantages derived from the attention previously bestowed upon the same subjects. A few of the most candid among the distinguished cultivators of knowledge, have left us a voluntary record, that they were indebted for their important discoveries to the suggestions of others, some even to accident and casualty. It is also true that individuals have lived at different periods, and under various circumstances, to whom the foregoing remarks, would not intirely apply ; those men have directed their view upon particular subjects, beyond the obscurity of the present, and embraced so much in their comprehension, as to leave scarcely any thing, for succeeding inference. But, such men as Bacon, Euclid, and Newton, exhibit phenomena rather than establish precedent.

It will not be necessary to prefer an apology, for the freedom with which I have noticed the sentiments of men occupying a more than ordinary elevation in publick regard. Names may become venerable, but cannot consecrate opinions, and those opinions when communicated, become publick property ; for every important truth which such men have planted in the fair field of science, they have conferred an obligation, which merits our gratitude ; but that truth requires culture, and if they have unfortunately scattered useless, or noxious weeds around it, general good demands, that the latter should be cleared away. But I contend for freedom of examination, I do not promise correction. It is much easier to detect the errours of others, than to avoid them ourselves.

## SKETCHES, &c.

FROM the earliest period in which man's attention to his own condition, and to the circumstances by which he was surrounded, became aroused, the life he possessed, and the properties of the matter presented to him, were no doubt objects of curiosity and interest. He was conscious of an existence of whose mode and essence he was ignorant; he was a witness to appearances, qualities and changes, with whose principles he was unacquainted. That surprise should be excited, and a wish for information awakened, was a consequence unavoidable: and, in pursuance of this wish, we find that in all ages, and in every state of man, some portion of the human family, have been seriously engaged in investigating the phenomena appropriate to themselves, and applying to the objects among which they were situated. Those efforts it is true were unskilful, and those attempts in a great measure, fruitless and unavailing; though the curiosity of all was eager to be gratified, few engaged earnestly in the pursuit; that all did not engage thus earnestly, is not more a matter of surprise for that remote period, than at the present time: every age has had its philosophers; and a large proportion of society, engaged in the various pursuits of pleasure or advantage, always have, and ever will, repose without exertion, upon the efforts of a few, in every thing not directly affecting their particular occupations. That those efforts were unsuccessful, was perhaps a necessary



consequence of time and situation ; except where providence for its wise purposes has condescended to become the immediate instructor of man, his knowledge would appear to be in a great measure the result of education.— The capacities which have been given him, must be exercised, he must become familiar with his own powers, and learn to direct their operations. In proportion as his wants are multiplied, those capacities become enlarged, and when necessity no longer presses him, pleasure and curiosity, afford him motives for action. But time, mutual efforts, and extended observation, are indispensable to the attainment of all those objects.

It would be foreign to the present purpose, to attempt a regular detail of the objects and modes, of human research and knowledge ; since the creation of man, those motives have always existed, and to a degree, have been at all times indulged. The laws of nature as before observed, have been in constant operation, in and around him ; and he has ever been solicitous for their evolution. The intelligence derived immediately from the senses, would naturally become the first subjects of examination : and we accordingly discover the earliest researches directed to familiar objects. I have no concern in this place with the progress of natural philosophy, except to shew that early attention had been paid to the forms and conditions of life ; the result of which has been the establishment of a scale of existence, at the head of which man assumed his station. Experience has confirmed his claim ; and improving knowledge has increased his desire to become more intimately acquainted with the principles on which that existence depends. Those reflections, will perhaps be called the speculations of youth ; I acknowledge it, and beg for indulgence : but I

thought it not amiss to go back for a moment, to simple truth : for it really appears to me, that in the progress of improvement, man has acquired a confidence in his powers, from which he hopes to subject much more to their control, than his situation requires, or providence intended : system has been growing upon system, until we have almost made a world for ourselves ; the rage for generalization has overthrown distinction and not unfrequently I fear, buried truth amidst its ruins. But the limits of duty shall not be transgressed, nor the restraints of confined understanding forgotten : I mean to apply the remark to the subject before us : animal life has been examined, opinions formed, and maxims established, which in my humble apprehension, though ingenious are arbitrary, though beautiful and interesting, are unnatural and unfounded. I will investigate the subject with what ability I can, I disclaim all self-sufficiency and confidence.

The result of all the enquiries directed to natural objects has been an agreement in establishing their relation to three prominent classes, the most distinguished of which has been made to embrace the subjects of the animal kingdom. Nor have the phenomena of vegetable life, and mineral organization been overlooked ; we are now satisfied that nothing exists either in vain, or by accident. An active principle pervades all nature, and presents to us every where proofs of its existence. Though unable to ascertain what those laws are, governing the properties of substances, wanting the more familiar signs of life, we have reason to believe, that those substances are not dead. We see effects which are uniform, and qualities which in the natural condition are permanent. I speak of what has been called inert matter : that condition which nature has wisely impressed for the fulfilment of her purposes, upon a part of her works. In tracing

the properties and modifications of the substances presented to us under this character, we have been engaged in investigating one of the most important departments of our natural or physical relation: and in nothing perhaps has our industry been more amply rewarded. Those modifications apply to us in ways innumerable, and those properties reach and affect us, in a manner which we perceive, but find a difficulty in comprehending. We have succeeded in converting many of them to the improvement of our condition. In the vegetable classes we discover a nearer approach to us, even in obvious circumstances: their structure more nearly resembles ours, and they are affected in a limited degree, by the same causes; they live sensibly; for they grow and propagate their species; they require nourishment, are affected by noxious causes, and may even lose altogether their peculiar life. What that peculiar life is, is the difficulty which presents itself on every hand; we see some evidence of it in the arrangement and organization of common matter: we see it more plainly in the structure, growth, self-preserving and self-propagating power of living vegetables; and more distinctly still in its animal condition. Between the vegetable and animal, we find one striking analogy; lop the vegetable, and it grows again, mutilate the animal, and you witness reproduction. But there is a difference, great by the design of providence; and for its object, perfect in its accomplishment; there are animal actions and operations. If the vegetable possess those actions and operations, it is in too confined a degree to give them a characteristic; the peculiar influence of certain agents upon particular vegetables, as the *Mimosa*, *Dionea*, &c. or possibly in some measure upon them all, is involved in total obscurity, and at most can only en-



large in a degree their living capacities. And does animal life really possess in a degree, and a very considerable degree, powers of recovery and self-preservation? What supports animal life for a length of time during the abstraction of nearly all foreign stimuli? What resists the influence of noxious causes? What reunites a broken bone? What reproduces destroyed muscle and membrane? What restores an emaciated body to original size and vigour? Animal life then is not simply a principle of mechanics, nor a living animal body a mere machine; subject only to the operation of a solitary law, and affected by a single cause, differing alone in its force of application, and sum of effect. It is advanced upon authority to which in the general, I feel pleasure in doing homage; that matter in all its forms is in itself quiescent, from the waves moved by the wind, and the sand impelled by the waves, up to the human body, controlled by its appropriate stimuli. The only difference consisting in the interruption or uniformity of the impulse. And that life in its sensible state, is the *effect* of stimuli, acting upon the sensibility and excitability which are extended over every external and internal part of the body. This conclusion appears just, but I confess does not to me obviate perplexity. What is this *sensibility* and *excitability* diffused over the whole body? What I would ask, created the principle of life? Can we form to ourselves any rational idea of an effect produced by what we call stimuli, in which effect life shall consist, absolutely? Is not this effect relative only? Take for instance the only presumable case, for illustration, the very one insisted upon in support of the advanced position; suppose a body suddenly deprived of all its sensible signs of life; in this state apply the artificial modes of restoration successfully; what is the infer-

ence? Do you give it life positively? Was its life extinct? No : Its life, or living capacity though greatly reduced, remained, and you applied the agents fitted to call it into more free action ; an hour longer, and though the materials of the body would have remained unchanged, you could not have *forced* it into the living condition : your stimulus then would have been the voice of Canute to the waters of the Hellespont.

I shall endeavour to shew by and by that this principle is subject to something more than mere rise and fall, and that it responds to agents differing in kind as well as degree. I have in vain endeavoured to persuade myself, that there was required but a particular sum of action in health, or that there was but one cause of disease. I cannot believe that stimulus and excitement in their ordinary acceptation, are all that is necessary for the production of either. I have said that an active principle pervades all nature, and presents to us every where proofs of its existence. What this active principle is, is a question which has been ever occurring, and never has, nor ever can be answered. That such a principle does exist, the evidence of our senses forbids us to doubt. From the most complex and perfect condition of created substance, down to the simplest form of organick matter, we witness its existence ; it is life in all its forms adapted to the circumstances in which it is placed. Perhaps all we can know respecting it, distinct from its actions and operations, is comprised in the beautiful saying, that it was the gift of the Almighty when he called a world into being ; that it shall continue in its appropriate forms so long as he wills, and be recalled at his pleasure. Life can never be known in the abstract, it is scrutable only by its phenomena, its operations and its effects. Its particular na-

ture can never be defined, for it can never be subjected to the cognizance of the senses. As well might we attempt to ascertain the peculiar essence of the infinitely diversified qualities of substances, and account for the varied effects of their endless combinations. It is this power in animals by which their actions are performed when living ; by the performance of those actions we distinguish certainly living from dead animal matter, and it is to its condition in animal bodies, and more particularly to its phenomena in man, that we are now to confine our attention.

Between that principle of vitality in animals which we are here considering, and the intelligent faculty called mind, there does not appear to me any specifick connexion ; I hold them as radically distinct, and find it impossible to believe with a distinguished medical philosopher of our country, that “mind and body were cast in the same mould.” This governing faculty of man, equally inscrutable with the principle in question and known only by its operations, frequently exercises those powers peculiar to itself, in full energy, when the animal actions are sunk to a point of feebleness, indicative of extreme decay. We will adduce in evidence the condition of the mind in protracted indisposition, and even in the progress of ordinary disease to a fatal termination, the mind’s operations in reviewing the past, examining the present, and anticipating the future, are upon many occasions equally lucid, energetick and correct, as they had been during health. It has been asserted, and not without strong indications of accuracy, that they were frequently more so. On the other hand we occasionally see the natural actions of the animal powers, carried on with their customary vigour, at a time when the intelligent functions are greatly im-

paired, sometimes when they are totally suspended, and consciousness itself extinct. The forms of apoplexy, injuries inflicted upon the head, the effects of particular articles, and certain states of mania, &c. establish the latter position. A reference also to inferior animals, perfect in their kind as animals, but destitute we believe of a distinct intelligent faculty, would tend to weaken the probability of essential connexion. And we discover a principle less perfect indeed, but bearing an analogy to this power, in the whole vegetable family, and exercising its laws over the forms and arrangements of common matter. How far we are to remove the specifick differences between the principle governing the conditions of matter in those different states; or whether that difference will apply more to the degree than the kind of life, is a problem of difficult solution. The fair presumption would appear to be, that life is changed to become adapted to the organization whose purposes it is to serve. This decision is however unimportant, we have sufficient evidence to designate the distinction. The doctrine of indivisibility, in animal and intelligent action, has met with many advocates: and has, I think been too much insisted upon in order to favour particular systems built upon the supposed principles of our science. Even the weight of that imposing authority previously referred to, has failed to convince me, "that the faculties of the mind act only by reflection from impressions upon the body;" independent of the subtleties of materialism\* in which such an admission involves us, it can never contribute to the attainment of knowledge to call in aid of one unknown

\* No imputation of materialism is here aimed at the author of the sentiment quoted. His mind though not great enough to avoid error, was too good to indulge in mischief.



power, another equally obscure. Though we must always admire, I think we ought to avoid confounding, the happy relation between the great ruling faculties whose combined effect confer upon man his decided pre-eminence.

Animal life has been emphatically called "a forced state." If by this is meant to be conveyed the sentiment which the language would appear to import, and in which sense I believe it has generally been received, viz : that it is an artificial condition dependent upon a particular sum of one kind of impulse, effected by agents for the most part foreign to the body, I cannot subscribe to it : it simplifies the mode of life it is true, but it violates every day's observation. On this supposition there is an assumed principle in the body, on which all the various agents which affect us, act alike, differing only in degree : these diversified natural actions which constitute the phenomena of life, are all the result of a solitary law ; and according to this supposition too, so long as this principle retained its capacity to be acted upon, and those agents could be applied, health ought not to fall off, nor death to make its approach. Where life would cease under those circumstances, it would be difficult to divine. That a capacity to be impressed, and one highly sensible, does exist, we well know, but are we prepared to admit that the effects of that impression are of one kind only ? Are not the material agents around us, possessed of qualities essentially and infinitely diversified ? Are not those qualities active ? And are we not in a greater or less degree constantly obnoxious to their effect ? and if those combinations of matter result in properties essentially distinct, and those properties are active when applied to the living principle sensible to their action, will not the cause and consequence correspond ? I should hesitate to affix a ne-

gative. May I be permitted to ask, for I will not forget that I am a stranger in the land of science. May I be permitted to ask, whether air, drink, food, exercise, wine, opium, mercury, and arsenick, are causes identically similar in kind, various only in force? Is the natural consequence of natural action in the body, the same with the effect of hurtful causes, admitting the asserted modification? Is disease and health one action, the former consisting in too much, or too little action? And is this the only variety among diseases? Are phrenitis and syphilis, small-pox and gout, measles and rheumatism, whooping cough and scarlatina, all members of the same family; having the same continuance, the same language, the same manners, and the same principles? In short to come at the subject in question, is every effect of impression upon the living principle, simply a *reaction*? Shall we then be safe in concluding that animal life bears no just parallel "with the oscillations of a pendulum, or the vibrations of a musical chord." That it does not necessarily consist in any precise sum of effect produced by particular agents, which effect is individual and uniform? The proof of this negative would rest with the fact, that those agents may be in a considerable degree weakened or withdrawn, without either death or disease occurring as a consequence. We know certainly, that the powers of the system will, (if I may use such phraseology,) make life for themselves, for a considerable time, under circumstances the least friendly; and it is somewhat singular that the advocates of indispensable force from foreign sources, should have cited in support of their opinion, the story of horses subsisting for three weeks upon cedar chips, and a dog living twenty days upon the indigestible cover of an old bible: it is more extraordinary still, that

this citation should have been immediately followed by the just remark, that the food stimulates the whole body by means of the process of digestion which goes forward in the stomach. The living principle is not passive, it acts when acted on, and the sensibility to impression, and faculty for operation, are both the result of fixed, regular, immutable laws, laws impressed upon matter for heaven's wise purposes, and accommodated to the objects it was intended to accomplish. Neither health nor disease can be reduced to a single principle, or an individual effect. Should it be urged in objection to the admission of various agents possessing peculiar qualities and appropriate effects when applied to the living body, that it is carrying us back to the era antecedent to the establishment of system in our profession. I can only answer, that when we have been led astray in the prosecution of a journey, by the indulgence of fancy and imagination, I know no better way of regaining the right path, than by retracing our steps until we arrive at a road with which we are more familiar, even should that movement carry us back to the point, at which we set out.

In a captivating theory of animal vitality, long the favourite child of medical philosophy, and which grew and flourished under the fostering care of general notice, its ingenious author has brought us almost into contact, with the important desideratum. He fancifully imagined that a certain quantity of sensitive principle, was bestowed upon us at birth, destined to controul the actions and operations of the powers over which it presided. This principle, capable of receiving and communicating impression, was so regulated, that when a moderate demand was made upon it, its actions balanced its powers, and equilibrium, in other words health was produced: when

the demand was increased, its capacities were exhausted in proportion to the sum of that demand ; and when it was reduced or withheld, those capacities became enlarged. But strange to relate, the body dependent upon those capacities was weakened in proportion as they increased. Here then we have the singular phenomena of an increasing quantity of the principle of life, while life itself was verging to extinction. As we approached the grave, the essential principle of existence was augmented, but was inactive, or acted only to pervert the purposes for which it was given. This condition of that principle, has been called morbid or accumulated excitability ; and as a familiar instance of such condition, we are referred to the state of digestive organ, when food has been extraordinarily withheld : under those circumstances we are told that death takes place after a full meal, from excess of stimulant effect upon this accumulated excitable principle. Though we are left to conjecture as to the peculiar mode of death, from the causes assigned, I believe we understand the inference as far as it is intelligible : yet as I am not satisfied of its correctness, I would beg leave to suggest a different mode of explanation. I shall say in another place, that when the natural actions of any part of the body are healthily performed, such part is supplied by the vital functions, with the energies necessary for the performance of that action. That in proportion to the demand of such part (within a certain range,) will be the supply ; when the former is reduced, the latter is diminished. Now when the stomach has less than usual of this natural action to perform, by the abstraction of food, its powers are weakened : withhold this material almost or altogether, and its peculiar energies fall very low : present to it now a full meal, and what is the conse-



quence? its energies cannot be immediately supplied, and it has a work to accomplish, for which it possesses no adequate powers; its actions are entirely overwhelmed, and its life ceases: it is a vital organ, and from laws of the animal economy, which we do not comprehend when any vital organ has its life taken away, the whole body falls into sympathy, and the animal dies. Something analogous to this obtains over the whole circle of animal actions; confines the motions of a limb, the arm for instance, or restrain them all together, while the general body is kept in ordinary health; what is the result established by observation? We shall find after a few days inaction; a sensible decline of its powers; continue the disuse, and its muscles contract but feebly. At this time direct the will upon those muscles, and call for a sudden exertion of all its powers; their small stock of energy, is exhausted in the effort, and the arm is instantly after powerless. Here, in the state of quiet, the action and energy, have been proportionate, both greatly diminished; in this case, too, the limb has fallen off somewhat in its life, its nutrition has been less perfect, and its volume is lessened. But the arm is not necessarily a vital member, and under favourable circumstances will recover both its life and its powers.

If those reasonings are correct, and I flatter myself they approach the truth, would not the inference establish the opposite of the conclusion proposed? would it not under those circumstances point out a defect rather than excess of the living principle? and should we not thus fix a condition more rational and consistent, by making the loss of vitality, instead of its increase, co-relative with the lapse towards the tomb.

The characteristic difference of the active principle, in other words life, though not the result of any combination of matter, appears to be intimately connected as it regards its perfection, with arrangement and structure. In common matter it has been considered simple, and has received the comprehensive appellation of attraction.—As we rise in the scale to vegetable, and higher still to animal structure, it seems to have been improved, and adapted to change of form: and in the latter, the connexion between the constitution of the principle, and the organization of the matter, becomes close and intimate. This discrimination has been long since established; and even among those who were anxious to give the soul a presence chamber in the body, there were apartments assigned for the subordinate ministry of the animal principle. It would be improper to attempt a history of the various opinions upon this subject; they have agitated all ages of medicine, and some of them have escaped the oblivion, thrown around the systems to which they gave a character.

Though the *Anima Medica*, the intelligent principle, an extensible soul, and the ærial spirit, with a long list of worthy associates, have gone quietly to rest, we have still wandering about, a *materia vitæ diffusa*; a *vis medicatrix naturæ*, and a principle of excitability. I do not presume to censure, or condemn; we must have language to convey our impressions, and our only guard against its abuse, is care in its selection.

Anatomy has rendered us familiar with animal structure, and impressions derived from observation connected with that acquaintance, have directed our attention to the brain and nervous system. It may be questionable, indeed, how far a knowledge of structure acquired from

anatomy, will contribute to unfold the mysteries of animal vitality ; but it is at least rational and interesting, to examine its general laws, and their connexions with the body, so far as they can be established, by observation and experiment. Too much has no doubt, been anticipated from this source. A hope has been indulged that even the philosophy of the mind, might receive some light from anatomical research, but hitherto dissection has been unproductive in this particular ; nor has an acquaintance with the mind's operations, opened the way to any thing more than a partial knowledge of the physiology of the body. Yet in the pursuit of information, the disappointments of extravagant expectation, are not to cut us off from the benefits of that intelligence, which has been rendered accessible.

The effects of injuries inflicted upon the brain, of ligatures and pressure upon the nerves, have induced us to believe that they were greatly concerned, as instruments, in performance of animal actions, and operations. In tracing the distribution of the latter by dissection, we find them directing their course to every important part ; and in greatest number and size generally, to parts destined to the performance of most vigorous action. And although we cannot detect sensibly, the nervous substance, in every portion of the body, we have no doubt the hand of omnipotence can have established connexions, far beyond the point, at which the eye and the knife of the anatomist have ceased to find an object. Various circumstances occurring in the progress of research, have led us to consider the nerves the media of sensation and action. Experiments made upon particular nerves, with a view of discovering their relation to the organs, to which they were appropriate ; together with the effect

of particular accidents upon the parts they affected, have given rise to that opinion, and to the present day, multiplied facts have only tended to confirm its probable accuracy. When it becomes established, that the nerves were subject to the influence of all agents applied to them, in a greater or less degree, and that the actions and operations of the body were effected through that medium, a capacity was attributed to them, designated by the term *energy*. The reception of this principle of nervous energy as an auxiliary in the prosecution of researches into animal life, was perhaps the most momentous occurrence in the history of that science. Though it was for a long time the parent of error, confusion and absurdity, if we possess at this day, any correct knowledge of animal actions, it is in my apprehension, the great ground work on which that knowledge has been raised. Here it enquired what was the precise nature of this energy, my own impressions upon the subject would lead to a candid declaration, that it was involved in total mystery. We believe there is such a principle, from witnessing actions or operations, upon the application of certain agents, which actions or operations constitute what we understand by the term *life*. The specific principle, in other words, the energy itself, cannot be rendered obvious, we know it but from its effects. It does not appear to be the consequence of any thing peculiar to the structure of the nerves; and we have justly, I think, discarded the systems built upon conjectures deduced from a regard to that structure. Every thing perhaps which we should be safe in advancing, may be comprised in a repetition of the asserted belief touching life in all its forms, that it is an incomprehensible condition of matter, arranged by infinite intelligence. We believe that the nervous system



has been assigned an important agency in the preservation of the phenomena of life, and that agency we refer to a principle which we call energy.

The correct performance of the operations of the animal body in the aggregate, constitutes the healthy or natural condition of that body : this is the only definition we can have of health. This performance of the natural actions we attribute to the agency of nervous energy, and this latter again depends for its support upon the actions produced. A mutual relation is thus established, and an equipoise preserved. This equipoise is the essential principle of health.

The natural action is not one and the same over the whole body : there are various, distinct, and separate functions, or rather effects of this action in parts, essential to health ; any change in those functions, is the proof of disease, or a diviation from the natural state.

The inference then, attempted to be established, is, that the nervous energy being the principle of action, action and energy would bear a just relation. That as action was the result of energy : the operation of that action was in turn, the production of that energy : action can only be performed through the medium of energy ; and the sum of the former must always correspond to that of the latter ; the limb in a state of disuse, will illustrate this position.

I think it not improper to notice an error or (at least an ambiguity) which has crept into our phraseology, upon a part of the subject we are now considering. It is in familiar use, not among the uninformed only, but with members, and distinguished ones too, of our profession, to say, that when one natural action of the body ceases, or is subtracted by accident or disease, such defect is sup-

plied by the increased action of others, or of all the rest : that the capacity of the whole, or of parts to be acted on, are augmented in a ratio proportionate to the preservation of the original sum of action. It is not necessary to adduce the instances cited in support of this assertion, such as the loss of an active part, the suspension of a particular function, &c. This appears to me another mistake on the score of accumulated, general, or partial excitability. And in accounting for the effects ascertained by observation, which has led to the error, I would say, that in consequence of the loss of one part another part which had shared naturally the same actions, is called upon by the necessities of the body, for more than its ordinary proportion of that action, and that energy for the performance of that action is gradually supplied, as the consequence of the gradually increasing action. The distinction thus set up, is as to the cause of increased action or power in a part: that it is not directly the result of the subtraction or suspension of one part or action, but the consequence of a gradually acquired habit of action, producing by the action itself, the energy necessary for its support. Were the opposite of this position true, in proportion to the progressive mutilation of the body, would be its increased vital powers: a consequence I presume too absurd to receive support or require refutation. It is by no means clear to me, that we are not distant from the fact, in the opinions we have adopted, respecting a familiar occurrence connected with this subject, to wit, in supposing that when one eye or one ear has been deprived of its functions, the capacity of the remaining one, has been increased by such loss. When such a loss has occurred, we acquire from necessity a habit of dependance upon the remaining one for sight, or sound, and from this circum-

stance are conscious of distinctness in vision or hearing. We perceive something of this kind, in the accuracy with which we distinguish objects, in the voluntary closure of one eye, when neither has been injured; that the same effect does not take place so sensibly, in the artificial stoppage of one ear, is perhaps to be attributed to the mechanical violence offered the auditory nerve, in producing the obstruction, such violence being propagated by sympathy to the opposite ear. Or, to admit that the natural capacity does become increased, under the circumstances noticed, would only be to prove, that the nervous energy was more freely supplied in consequence of the increased demand made upon it. Were one arm removed from the body, and the other confined strictly within its ordinary limits of action antecedent to such loss, it would acquire increased force, extent or variety of action.

Particular causes may act in such a way, as to destroy the natural relation between the principle and the action; the natural actions, are not only subject to increase, or diminution, but may be changed in kind. On this presumption, we hold the variety of diseased actions in the body. Every considerable effect upon the natural action, produces some alteration in the kind of action. When the natural action of a part is lessened, weakness is the consequence; its actions having been interrupted, or changed, its natural energies are not supplied: as the interruption continues, the consequences are rendered sensible by the loss of power, and the establishment of disease, or an altered condition, such as in inflammation. When any agents proternaturally increase the actions of the whole or a part, the energy is applied until the balance is lost: The actions being altered, the natural energies become

wasted, and the actions not being of a proper kind to reproduce them, the body or the part falls off, and in proportion to the force and continuance of the cause, debility or death is the consequence. On this principle, action destroys vigour, and the system is sinking while the actions continue. We can only save it, by reducing action while the powers remain, and when the latter have fallen low, by affording it proper materials for the production of energy. When exciting causes are applied to the body, or a part, they have been supposed to effect an increase of material action; but all the agents foreign to the natural economy of the body, possess peculiar properties; they can act only by their properties, and if they do not produce a modification of action, how, I would ask, does Syphilitic and variolous virus, cause each its appropriate effect, and produce as a consequence, diseases uniform in their character, and going on to the formation of matter endued with qualities identically similar to that of the exciting cause. It is true, that in the agency of every cause, we do not discover changes equally sensible; as we approach the natural excitors this peculiar effect is less obvious. Certain materials appear to be almost limited to a simple increase of the natural powers. Were not this the case, we should be exposed to danger, from sources innumerable.

Various causes affecting the body in a sudden and violent manner, consistent with their nature or qualities, produce effects without sensible changes except as to degree; such for instance as in Syncope; the mind holds control over the body, and may be sometimes affected in such a manner as to produce the same effect. Here the cause has interrupted the natural actions of the body, and thrown it for a time, and to a degree, beyond the control



of the laws of its own energy: in this case the actions are suspended without a waste of the energy; when the suspending cause ceases, action and energy, soon regain their relation, and the natural condition is reestablished. Were not this the act, were the energy exhausted, death I presume would occur from every case of general syncope, as action could not be restored without energy, nor energy reproduced without action. If the actions were long suspended, the energy would be lost, and death a necessary consequence.

Poisons act in a manner peculiar, and unknown. They possess specifick properties, and in accordance with the relative force of those properties when applied to the body, they interrupt or subdue the natural powers and actions, and subject it in a proportionate degree, to the laws of their own qualities.

The brain has been considered the great source of nervous energy; and whatever importance observation and experiment may have assigned to the apparently distinct properties of nerves, it seems reasonable to conclude, that an intimate connexion and dependance, exist between all the parts of the nervous system: the proportion of that system constituted by the brain, is essential to its perfection and indispensable to the continued performance of those actions in which complete life consists. On this subject our knowledge has made a pause, baffled research, and almost forbids the hope, that it can ever become progressive.

I here withdraw from a task to which I feel unequal, but whose performance it was a duty to attempt. To those whose notice of this work is of most importance to the writer, it is unnecessary to suggest, the confined and partial view, permitted by custom to works of this cha-

raeter, they will not forget, nor shall I complain of that restraint; were the utmost licence indulged, I am aware that limited indulgence would still present insuperable difficulty. For whatever of truth this essay may contain, I am indebted to others, its errors are the consequence of my own misconception.

To all the the professors of the institution, under whose auspices I prosecuted the search for professional acquirements, I feel sensibly, and acknowledge with pleasure, my serious obligations. How far I have benefited by their labours, is not here a question; the effort to confer advantage, is entitled to my gratitude. No exertion has been wanting, no aid withheld, which could facilitate enquiry, or contribute to improvement. Nor, if I may indulge a confidence in my own judgment upon the occasion, has that exertion been deficient in skill, or that aid inadequate to its object. From the institution as an individual, I have nothing farther to expect: but I shall ever preserve a deeply rooted regard for its prosperity, and I indulge the hope that society will be early aroused to a full sense of its important connexion with their welfare, and will do justice to the motives and the merit which have raised it out of nothing, and supported with honour, what had been created with difficulty.

## ERRATA.

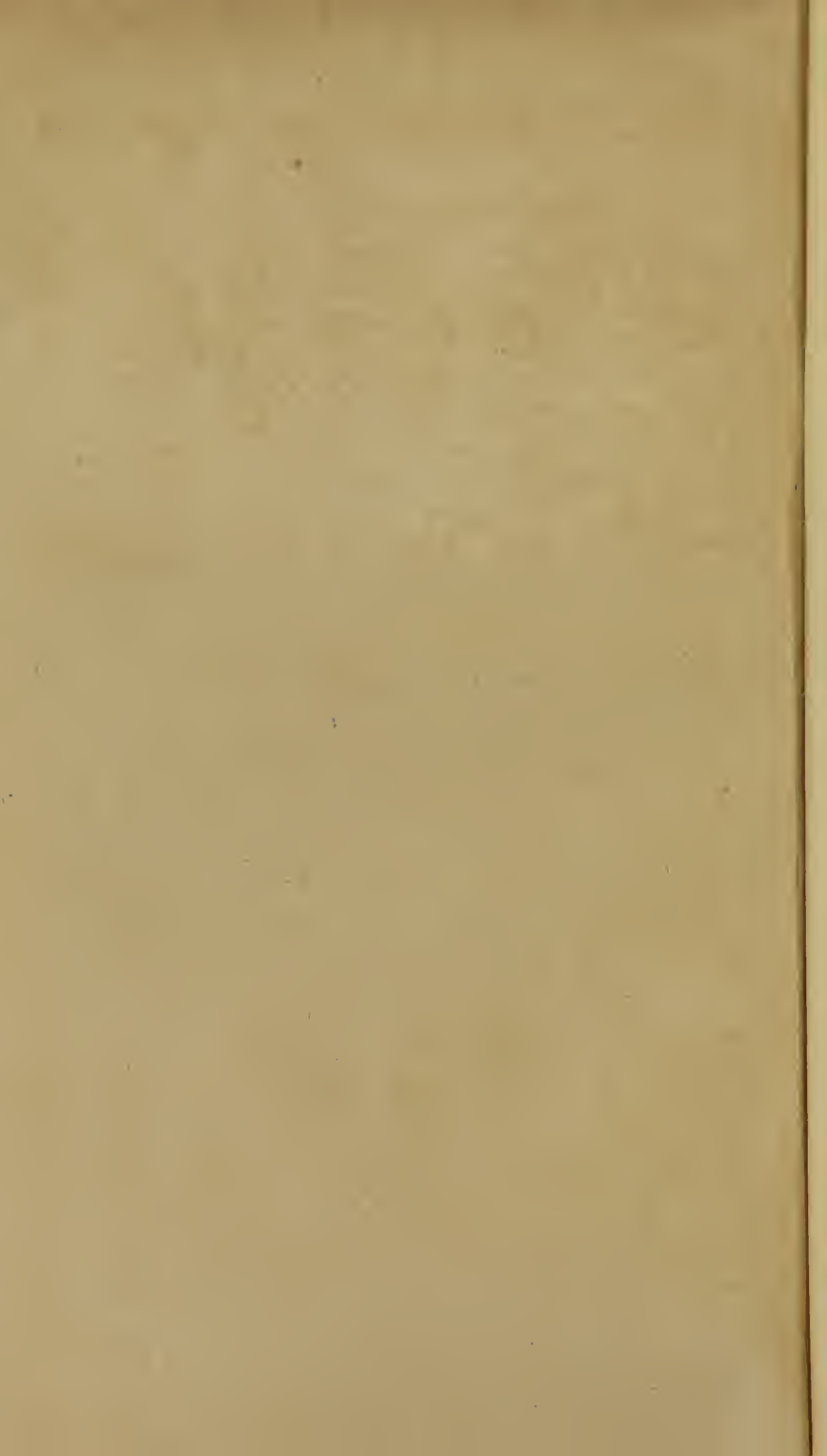
Page 16, line 10, for *vegetable family* read *vegetable world*.

Page 21, line 9, for *confines* read *confine*; line 31 for *e o-relative* read *correlative*.

Page 22, line 24, for *materia vitæ* read *materia vitæ*.

Page 24, line 16, for *Here* it enquired read *Were* it enquired.

Page 25, line 17, for or a *diviation* read or a *deviation*.







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